

I CLAIM

1. A tunable chromatic optical signal dispersion compensator comprising
three cascaded Mach-Zehnder interferometers, MZIs,
5 a first MZI including a fixed 50/50 coupler for receiving an input optical signal,
a second MZI including a first adjustable coupler that is shared with the first MZI and a
second adjustable coupler that is shared a third MZI, the second MZI further including
a half-wave plate positioned across the midpoints of the two path lengths of the second
10 MZI so as to exchange the TE and TM polarizations of the optical signals passing
through the two path lengths,
the third MZI including a fixed 50/50 coupler for outputting a dispersion-adjusted
output optical signal and
15 wherein said first and second shared adjustable couplers are adjusted with equal
coupling ratios using a single control signal to provide adjustable dispersion
compensation to the output signal.
2. The optical signal dispersion compensator of claim 1 wherein the first and
third MZIs have a path-length difference ΔL and the second MZI has a path-length
difference $2\Delta L$.
3. The optical signal dispersion compensator of claim 1 wherein when the two
adjustable couplers are set to a 100/0 coupling ratio, the optical signal dispersion
compensator has zero dispersion and wherein the dispersion can be tuned positive or
negative by adjusting the two adjustable couplers towards a 50/50 coupling ratio.

4. The optical signal dispersion compensator of claim 1 wherein each of the two adjustable couplers is implemented using an MZI with phase shifters.

5. The optical signal dispersion compensator of claim 4 wherein the MZI in the adjustable couplers has a zero-electrical-power path-length difference of a half wavelength so that when no electrical power is applied the compensator exhibits zero dispersion.

6. The optical signal dispersion compensator of claim 4 wherein the phase shifters of each of the two adjustable couplers uses thermo-optic heaters operated in a push-pull manner by the single control signal.

7. The optical signal dispersion compensator of claim 1 implemented as a planar optical integrated circuit.

8. The optical signal dispersion compensator of claim 1 wherein the fixed 50/50 couplers are y-branch couplers.

9. The optical signal dispersion compensator of claim 1 being integrated as part of an optical apparatus consisting of one or more of the following optical components

- an optical transmitter,
- an optical amplifier,
- an optical filter,
- a wavelength multiplexer,
- a wavelength demultiplexer,
- and an optical receiver.

10. The optical signal dispersion compensator of claim 1 being used in a multi-wavelength channel system, the optical signal dispersion compensator having a free-spectral range equal to the system channel spacing divided by an integer.

11. A reflective tunable chromatic optical signal dispersion compensator comprising

a first MZI including a fixed 50/50 coupler for receiving an input optical signal at a first port and an adjustable coupler, that is shared with a second reflective MZI, the path-length difference between the two arms in the second MZI is equal to that of the first MZI and

wherein the adjustable coupler is responsive to a control signal for controlling the amount of signal dispersion added by said compensator to the input optical signal to form the output optical signal.

12 . The reflective optical signal dispersion compensator of claim 11 further comprising a quarter-wave plate located in front of a reflective facet of the second MZI.

13 A polarization independent tunable chromatic optical signal dispersion compensator, TDC, apparatus comprising

a cascaded arrangement of a first TDC and a second TDC, each TDC comprising

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a first MZI including a fixed 50/50 coupler for receiving an input optical signal,

a second MZI including a first adjustable coupler that is shared with the first MZI and a second adjustable coupler that is shared a third MZI, and the third MZI including a

10 fixed 50/50 coupler for outputting a dispersion-adjusted output optical signal and

wherein said first and second shared adjustable couplers in the first and TDC and the second TDC are all adjusted with equal coupling ratios using a single control signal to provide adjustable dispersion compensation to the output signal.

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14. The cascaded TDC of claim 13, wherein a half wave plate is positioned between the two TDCs in order to achieve low polarization dependence.

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15. A reflective TDC comprising of
a first MZI including a fixed 50/50 coupler for receiving an input optical signal,
a second MZI including a first adjustable coupler that is shared with the first MZI and a second adjustable coupler that is shared a third MZI, and a third MZI including a fixed 50/50 coupler for outputting a dispersion-adjusted output optical signal, connected to a reflector such that the signal passes twice through the MZI arrangement

16. The reflective TDC of claim 15 wherein a quarter wave plate is positioned between the TDC and the reflector in order to achieve low polarization dependence.